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What is claimed is:

1. An arithmetic decoding method in which arithmetic decoding is performed in pipeline processing on arithmetic coded data obtained by performing arithmetic coding on orthogonal transformation coefficients of multi-valued data, the method comprising:

determining whether input arithmetic coded data belongs to a more probable symbol or a less probable symbol on a number line that is divided using a probability estimation value of the more probable symbol and a probability estimation value of the less probable symbol, and outputting, as a decoded symbol, a predicted value of a symbol to which the arithmetic coded data belongs;

assigning a context, using a context model formed to be common to a DC component and an AC component, to each node of a context tree constructed corresponding to a decision sequence having tree-structured decision events to perform binary decomposition on the orthogonal transformation coefficients in performing arithmetic coding, transiting on the context tree corresponding to a value of the decoded symbol whenever the decoded symbol is generated, and extracting a context assigned to the node of a transition destination; and

estimating a probability estimation value of a less probable symbol, a predicted value of a more probable symbol or the less probable symbol corresponding to the output context to provide to the determining.

2. The arithmetic decoding method according to claim 1, further comprising arranging the decision events in the decision sequence, so that a decision result is output faster as a numerical value of each of the orthogonal transformation coefficients is smaller.

3. The arithmetic decoding method according to claim 1, wherein the orthogonal transformation coefficients include EOB information detected after rearranging the order and positive/negative information of each of the orthogonal transformation coefficients, and the decision events are arranged in the decision sequence so that the binary decomposition is first performed on the EOB information and the positive/negative information, and then performed on numerical values of the orthogonal transformation coefficients.

4. The arithmetic decoding method according to claim 1, wherein in the decision sequence, "1" or "0" is assigned to a decision result corresponding to each of the decision events, and the orthogonal transformation coefficients are transformed into a decision result of binary code series.

5. An arithmetic decoding apparatus in which arithmetic decoding is performed in pipeline processing on arithmetic coded data obtained by performing arithmetic coding on orthogonal transformation coefficients of multi-valued data, the apparatus comprising:

an arithmetic decoding calculator which determines whether input arithmetic coded data belongs to a more probable symbol or a less probable symbol on a number line that is divided using a probability estimation value of the more probable symbol and a probability estimation value of the less probable symbol, and outputs, as a decoded symbol, a predicted value of a symbol to which the arithmetic coded data belongs;

a context generator which has a state transition table in which a state number is registered corresponding to each of decision events used in performing binary decomposition on the orthogonal transformation coefficients in performing arithmetic coding, a context determined for each state number based on a context model common to a DC component and an AC component, and a next state number to which transition proceeds corresponding to a value of a decoded symbol, and generating a context corresponding to the state number whenever a decoded symbol is generated; and

an estimator which estimates a predicted value of a more probable symbol and a probability estimation value of a less probable symbol corresponding to the context output from the context generator to provide to the arithmetic decoding calculator.

6. The arithmetic decoding apparatus according to claim 5, wherein

the context generator generates four contexts corresponding to state numbers of destinations of transition of two-cycle ahead respectively using the state transition table, the estimator further comprising:

two probability estimation memories which store probability estimation values of less probable symbols associated with state numbers, while storing, for each state number, a current probability estimation value of a less probable symbol for a context associated with the state number, and further storing a future probability estimation value for the same context as the context, provided for the future where normalization occurs and a prediction condition is updated;

four context memories which store a predicated value of a more probable symbol for each context of the context model, a probability estimation value of a less probable symbol in each context, and state numbers to access the probability estimation memories; and

a selector which is configured to select two state numbers from among four state numbers output in parallel from the context memories respectively corresponding to four contexts generated in the context generator according to a latest decoded symbol, while selecting between probability estimation values output in parallel from the probability estimation memories corresponding to the selected two state numbers, according to the latest decoded symbol.

7. The arithmetic decoding apparatus according to claim 6, wherein generation of context, reading of the probability estimation memories, reading of the context memories and arithmetic decoding calculation is executed

in the same cycle to be pipelined, thereby executing decoding of a single pixel in a single cycle.

## ABSTRACT OF THE DISCLOSURE

An arithmetic decoding apparatus is provided that carries out complete pipeline processing. Fluctuations in the pipeline caused by occurrence of the normalization are resolved by using a future-predicted Qe memory. In coding multi-valued images, common contexts are generated without distinguishing between AC and DC components of DCT coefficients.